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NON-SPECIFICITY OF HOST-SELECTION IN THE ECTOPARASITIC SNAIL *ODOSTOMIA (MENESTHO) BISUTURALIS* (SAY) (GASTROPODA: PYRAMIDELLIDAE)

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ABSTRACT. Ectoparasitic pyramidellid gastropods have often been considered host-specific, although a few species have been reported to feed on a variety of hosts under laboratory conditions. A large population of *Odostomia* (*Menestho*) *bisuturalis* (Say) at Duxbury Beach, Massachusetts, provided an ideal opportunity to study the association of this ectoparasite with the various mollusks found in the vicinity. Our results revealed that *O. bisuturalis* was associated with seven species of mollusks, most commonly *Nassarius obsoletus* (Say) and *Mytilus edulis* Linnaeus. The great abundance of *O. bisuturalis* and the fact that *Crassostrea virginica* (Gmelin), its usual natural host, was absent from the study area, appear to account for the non-host-specificity observed.

INTRODUCTION

The host-specificity of the ectoparasitic snails of the family Pyramidellidae has been the subject of several papers during the last decade. Early observations led some workers, notably Fretter and Graham (1949; 1962), to state that these ectoparasites were host-specific. More recent studies have revealed that under laboratory conditions certain pyramidellids actually feed on a variety of hosts (Ankel and Christensen, 1963; Scheltema, 1965; Robertson, personal communication), although possible host-preference may be a factor (Boss and Merrill, 1965). The observations reported here suggest that some species of pyramidellids are not host-specific.

What actually constitutes a true parasitic relationship has been questioned (Robertson and Orr, 1961; Dehlinger, unpublished MS). While observations of pyramidellids associated with various organisms indicate, by their proximity or physical contact, possible parasite-host relationships, most authors have been wary of such evidence. Robertson (personal communication) stated that the presence of an *Odostomia* on a possible host may only reflect the pyramidellid's need for a suitable substrate. This view is supported by some of our observations and those of Scheltema (1965), who noted *O. bisuturalis* clinging to the under surfaces of stones in a region where *Littorina littorea* L., a "laboratory host" for this species, was abundant. Recent workers have indicated what constitutes a true parasitic relationship: insertion of the proboscis and action of the buccal pump (Robertson, personal communication; Scheltema, 1965) or when the parasite is "less than ⅛ in. from the edge of the mantle of the host" (Boss and Merrill, 1965). Although the former is a more exact method, we have necessarily followed Boss and Merrill (1965), since our observations were made during the low tide period when the ectoparasites were not actively feeding on exposed hosts.

OBSERVATIONS

An abundance of *Odostomia* (*Menestho*) *bisuturalis* (Say, 1822) was noted on the tidal flat on the harbor side of Duxbury Beach, Massachusetts, in June, 1969. Sampling at several stations along the beach during a -1.6 tide on 3 June and subsequent visits to the study area provided ample field evidence of the occurrence of this snail on numerous intertidal molluscan hosts.

The *Odostomia* were not limited to a particular region of the tidal flat, for they were found from below the low-water mark to the upper portion of the intertidal zone. Quantitative samples were taken in the region at the east end of the Duxbury Beach bridge. All mollusks collected were carefully examined for the presence of *Odostomia. O. bisuturalis,* the only pyramidellid found, was collected from seven different species of mollusks: *Littorina littorea* (L.), *Urosalpinx cinereus* (Say), *Crepidula convexa* Say, *Crepidula fornicata* (L.), *Nassarius obsoletus* (Say), *Nassarius trivittatus* (Say), and *Mytilus edulis* Linnaeus. They were also observed on the egg capsules of *Nassarius* sp. and *Polinices* sp., and on empty shells.

O. bisuturalis was most abundant on three hosts: *Mytilus edulis,* which formed large mats on the mud flats, and on the snails *Nassarius obsoletus* and *Littorina littorea,* which occasionally had from one to three ectoparasites on the operculum or on the lip of the shell. The *Mytilus* that were observed in water often had a number of ectoparasites situated on the margins of the mantle, away from the hinge, similar to the position assumed in *Odostomia scalaris* MacGillivray on *Mytilus* in Europe. However, most of the *Mytilus* population at Duxbury was exposed at low tide and the ectoparasites had migrated to moist areas within the *Mytilus* mat. In the laboratory we have observed *O. bisuturalis* feeding on *Mytilus.*

Table I shows the relative abundance of *Odostomia* on three hosts. In the case of *Nassarius obsoletus* several items should be noted: 1) the parasites occurred on samples with a large mean length in a frequency of one *Odostomia* to three or four *Nassarius;* 2) smaller individuals of *Nassarius* were significantly less parasitized, with only one parasite per ten individuals. This latter observation was also noted in studies of *O. impressa* (Say) (Hopkins, 1956) and *O. dianthophila* Wells and Wells (Wells and Wells, 1961). At one station *N. obsoletus* was present in large numbers, possibly 12,000/m^2, with an equally high concentration of *O. bisuturalis,* 7,000/m^2. These figures indicate that at times *O. bisuturalis,* a usually overlooked organism, must play a moderately significant role in the flow of energy in a tidal flat community. In other species, not quantitatively sampled, the occurrence of *Odostomia* was even greater, in some cases amounting to two ectoparasites per host, e.g., *Littorina.*

Previous published records of field observations have not revealed *O. bisuturalis* in association with any of the seven species of mollusks reported in this study. In the laboratory, *O. bisuturalis* is known to feed on: *Littorina littorea* (L.) (Scheltema, 1965; Robertson, 1967); *Bittium alternatum* (Say) (Scheltema, 1965); *Crucibulum striatum* (Say) and *Crepidula fornicata* (L.) (Boss and Merrill, 1965). Previously, the only known natural host of *O. bisuturalis* was the American oyster, *Crassostrea virginica* (Gmelin) (Loosanoff, 1956; Boss and Merrill, 1965), a species not present at Duxbury Beach.

DISCUSSION

These observations demonstrate that at least one pyramidellid is not host-specific. Further, laboratory studies have shown that certain *Odostomia* may have numerous hosts. Thus, should these species actually be non-host-specific, as *O. bisuturalis* seems to be, an examination of all environmental factors involved in host-specificity and host-preference becomes imperative.

The great abundance of *O. bisuturalis* led to the consideration of the question of density-dependent factors in feeding behaviour. While our observations show the non-specific host-selection of *O. bisuturalis,* they do not reveal any specific information concerning host-preference. An abnormally large population of *O. bisuturalis* or a diminished preferred food source might force many individuals to feed on hosts they would otherwise reject.

The biological relationship between a motile ectoparasite and host-species can be likened to that between a predator and its prey. The odostomia-type of predator-prey relationship with respect to food preference is commonly observed in animals not totally dependent on one organism for survival. It has been demonstrated that total food abundance, relative abundance of food types, spatial distribution of foods and predator satiation affect feeding preferences in some animals (Ivlev, 1961). In mollusks, for example, Wells (1958) found that although the opportunistic gastropod *Fasciolaria hunteria* (Perry) prefers to eat the small oyster drill, *Urosalpinx,* it will eat oysters if only a minimal number of the more desirable gastropods are present. Further, in a study of the relationship between time and energy in food preferences, Emlen (1966: 617) suggested that: 1) "Animals should be more selective in their choice of foods when satiated or when food is common, more indiscriminate when starved or when food is scarce"; and, 2) "Food preferences appear to change readily and appropriately to changes in the environment."

The particular circumstances in which the ectoparasitic population existed were unusual in that: 1) there was a very large population of ectoparasites; and, 2) the preferred natural host for this species, *Crassostrea virginica,* was not present in the local ecosystem. Thus, our observations corroborate the hypotheses of Emlen and indicate that *Odostomia bisuturalis* may have various host-species under natural conditions.

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TABLE I.
Occurrence of *Odostomia bisuturalis* on Hosts at Duxbury Beach, Massachusetts, in June, 1969

Host	Size of sample hosts/parasites	Sampled area (m^2)	Total hosts/(m^2)	Total parasites/(m^2)	Ratio parasites/host	Length range of hosts (mm)	Mean length of hosts (mm)	Length range of parasites (mm)	Mean length of parasites (mm)
N. obsoletus	44/16	1/4	176	64	.360	6.9-20.3	15.85	1.84-3.36	2.61
	97/55	1/128	12416	7040	.567	11.1-20.8	15.46	1.84-4.08	2.81
	235/21	1/4	940	84	.089	4.5-20.0	9.53	1.92-3.60	2.56
	84/25	1/4	336	100	.297	5.7-19.5	16.02	1.92-4.24	2.59
L. littorea	27/42				1.55	15.0-23.3	18.27	1.12-3.84	2.32
	2/4				2	11.8-17.1	14.45	2.00-2.72	2.50
U. cinereus	12/13				1.08	3.6-26.8	20.12	1.52-3.52	2.42

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